Climate Change and Human Health Literature Portal

National Institute of
Environmental Health Sciences

Global premature mortality due to anthropogenic outdoor air pollution and the contribution of past climate change

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Abstract:

Increased concentrations of ozone and fine particulate matter (PM2.5) since preindustrial times reflect increased emissions, but also contributions of past climate change. Here we use modeled concentrations from an ensemble of chemistry-climate models to estimate the global burden of anthropogenic outdoor air pollution on present-day premature human mortality, and the component of that burden attributable to past climate change. Using simulated concentrations for 2000 and 1850 and concentration-response functions (CRFs), we estimate that, at present, 470 000 (95% confidence interval, 140 000 to 900 000) premature respiratory deaths are associated globally and annually with anthropogenic ozone, and 2.1 (1.3 to 3.0) million deaths with anthropogenic PM2.5-related cardiopulmonary diseases (93%) and lung cancer (7%). These estimates are smaller than ones from previous studies because we use modeled 1850 air pollution rather than a counterfactual low concentration, and because of different emissions. Uncertainty in CRFs contributes more to overall uncertainty than the spread of model results. Mortality attributed to the effects of past climate change on air quality is considerably smaller than the global burden: 1500 (-20 000 to 27 000) deaths yr(-1) due to ozone and 2200 (-350 000 to 140 000) due to PM2.5. The small multi-model means are coincidental, as there are larger ranges of results for individual models, reflected in the large uncertainties, with some models suggesting that past climate change has reduced air pollution mortality.

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Resource Description

Exposure : ☒

weather or climate related pathway by which climate change affects health

Air Pollution

   Air Pollution: Ozone, Particulate Matter

Geographic Feature: ☒

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ⊠

resource focuses on specific location

Global or Unspecified

Health Impact: ⊠

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Respiratory Effect

Cardiovascular Effect: Other Cardiovascular Effect

Cardiovascular Disease (other): cardiopulmonary mortality

Respiratory Effect: Other Respiratory Effect

Respiratory Condition (other) : respiratory mortality; lung cancer mortality

Resource Type: ⊠

format or standard characteristic of resource

Research Article, Research Article

Timescale: ⊠

time period studied

Time Scale Unspecified